

RECEIVED
CENTRAL FAX CENTER**SEP 26 2006****REMARKS**

Applicants have studied the Office Action dated June 26, 2006. Claims 7 and 19 have been amended. It is submitted that the application, as amended, is now in condition for allowance. Claims 3-7, 9-10, 15-19, 21-22, 29 and 30 are pending. Reconsideration and further examination of the pending claims in view of the following remarks is respectfully requested. In the Office Action, the Examiner:

- (1-2) rejected claims 4, 7, 8, and 29 under 35 U.S.C. §102(b) as being anticipated by Davidson (U.S. Patent No. 6,140,141);
- (3-5) rejected claims 3, 9, and 10 under 35 U.S.C. § 103(a) as being unpatentable over Davidson (U.S. Patent No. 6,140,141) in view of Paniccia (U.S. Patent No. 6,251,706);
- (6) rejected claims 5 and 6 under 35 U.S.C. § 103(a) as being unpatentable over Davidson (U.S. Patent No. 6,140,141) in view of Yamada et al. (U.S. Patent No. 5,349,499);
- (7) rejected claims 15, 16, 19-22, and 30 under 35 U.S.C. § 103(a) as being unpatentable over Davidson (U.S. Patent No. 6,140,141) in view of Paniccia (U.S. Patent No. 6,251,706); and
- (8) rejected claims 17 and 18 under 35 U.S.C. § 103(a) as being unpatentable over Davidson (U.S. Patent No. 6,140,141) and Paniccia (U.S. Patent No. 6,251,706) in view of Yamada et al. (U.S. Patent No. 5,349,499).

Examiner Interview

The Applicants wish to thank Examiner Jagan for a telephonic interview on Friday September 22, 2006. In that interview, the Applicants' representative Scott Smiley and the Examiner discussed placing the subject application into condition for allowance by amending independent claims 7 and 19 to recite "above 3.6 microns" to clarify the proper range of the photon transmission through the duct made from polished silicon, quartz, sapphire, glass and diamond. No agreement was reached on whether this distinguished over the prior art.

YOR920030425US1

6 of 14

10/699,399

(1-2) Rejection under 35 U.S.C. § 102(b) Davidson

In items 1-2 of the Office action, the Examiner rejected claims 4, 7, 8, and 29 under 35 U.S.C. § 102(b) as being anticipated by Davidson (U.S. Patent No. 6,140,141).

Before discussing the prior art in detail, it is believed that a brief review of the invention as claimed, would be helpful. Independent claim 7 recites, *inter alia*:

... a photon detector located adjacent to the duct for detecting photons emitted from the electronic device, wherein the duct and the coolant are at least partially transparent to photons **with wavelengths above 3.6 microns** and the duct is made of at least one of **polished silicon, quartz, sapphire, glass, and diamond**.
(emphasis added)

The present invention is a device for measuring thermal distributions on a chip. The device includes a duct (805) located above, and coupled to, an electronic device (101). The duct (805) has an at least partially **transparent upper wall (804) that is made of polished silicon, quartz, sapphire, glass, or diamond** and uses an upper surface (103) of the electronic device (101) as its bottom wall. Within the duct (805) is a transparent fluid (806) that flows over the top surface (103) of the electronic device (101) in order to cool the device. Paras. 0053 and 0056 and FIG. 8 of the instant application.

A photon detector (802) is located above the chip and measures infrared radiation emitted by the chip to calculate a thermal distribution of the chip. Para. 0056 of the instant specification. For proper measurement of a thermal distribution on the back of the chip, the photon detector must see through the upper surface of the duct and fluid to the back surface of the chip throughout the entire infrared frequency range. See FIG. 8. The infrared frequency range includes wavelengths between 2.6 microns to 20 microns. For this reason, the materials (*the duct and the coolant*) of the present invention are selected so as to be *at least partially transparent to photons with wavelengths above 3.6 microns*. Claim 7. Few materials are transparent at these wavelengths. Therefore, the present invention makes use of polished silicon, quartz, sapphire, glass, and diamond, which are all transparent to infrared radiation with wavelengths above 3.6 microns.

YOR920030425US1

7 of 14

10/699,399

Claim 7 was previously amended to recite the materials that can be used for the duct of the present invention. These materials include polished silicon, quartz, sapphire, glass, and diamond and are chosen because they are transparent to frequencies having wavelengths above 3.6 microns. Applicants would like to point out that the Examiner, in rejecting claim 7 over Davidson, fails to allege that the Davidson reference shows any of these materials that were added to claim 7 in the previous amendment.

The invention of Davidson is not directed to measuring thermal distributions of chips, as is the present invention. Davidson senses voltages of signals on a die. Davidson, col. 3, lines 41-42. An important distinction between the two inventions is that **in Davidson, the voltages are not measured by sensing infrared radiation**, but by sensing a polarization of light reflected back from the device (Col. 1, lines 25-29) or by measuring the intensity of **near-infrared** radiation (Col. 2, lines 58-60) emitted from the circuit.

Near-infrared radiation, as is known in the art, is well defined as a range of wavelengths between 0.75 and 2.5 microns. **Davidson gives two, and only two, possible materials that are used for the window 110.** The materials are fused quartz and BK-7 glass. Davidson, col. 3, lines 1-2. Both fused quartz and BK-7 glass are inoperable for thermal imaging, because they are not transparent to wavelengths above 2.5 microns.^{1 2}

The Applicants are filing a Declaration under 37 C.F.R. §1.132 from Dr. Emanuel Tutue (attached hereto). Dr. Tutue is a post doctoral researcher at IBM with 8 years of experience working as a physicist. Dr. Tutue is familiar with infra-red radiation along

¹ For BK-7 Glass the "Useful Wavelength Range, Transmission (microns) 0.32-2.30" See for example <http://www.harricksci.com/infoserver/Optical%20Materials/BK-7%20Glass.cfm> and http://www.mellesgriot.com/products/optics/mp_3_1.htm and for fused quartz see at least http://www.mellesgriot.com/products/optics/mp_3_2.htm

² On page 2 of the June 26, 2006, the Examiner states "fused quartz (up to 3.6 microns) or BK7 glass (0.25 - 2.9 microns)" and this is clearly the range claimed in independent claims 1 and 17 of "wavelengths above 3.6 microns"

with the corresponding general wavelength of transmission of two groups of materials: i) fused quartz and B-K glass and ii) polished silicon, quartz, sapphire, glass and diamond. The expert opinion of Dr. Tutue supports that fused quartz and BK-7 glass as disclosed by Davidson are inoperable for thermal imaging above 4 microns.

The Davidson reference, therefore, does not show a duct that is at least partially transparent to photons with wavelengths above 3.6 microns and made of at least one of polished silicon, quartz, sapphire, glass, and diamond. The Examiner cites 35 U.S.C. § 102(b) and a proper rejection requires that a single reference teach (i.e., identically describe) each and every element of the rejected claims as being anticipated by Davidson.³ Because the elements in independent claim 7 (at least "the duct and the coolant are at least partially transparent to photons with wavelengths above 3.6 microns and the duct is made of at least one of polished silicon, quartz, sapphire, glass, and diamond") of the instant application are not taught or disclosed by Davidson, the apparatus of Davidson does not anticipate the present invention. Dependent claims 4, 8, and 29 are believed to be patentable as well because they are dependent on claim 7. Applicants respectfully submit that the Examiner's rejection under 35 U.S.C. § 102(b) has been overcome.

(3-5) Rejection under 35 U.S.C. § 103(a) Davidson and Paniccia

As noted above, the Examiner rejected claims 3, 9, and 10 under 35 U.S.C. § 103(a) as being unpatentable over Davidson in view of Paniccia (U.S. Patent No. 6,251,706).

In the section entitled "(1-2) Rejection under 35 U.S.C. § 102(b) Davidson" above, the deficiencies of the prior-art system disclosed in the Davidson reference were discussed. Claims 3, 9, and 10 depend directly from newly amended claim 7. Independent claim 7 distinguishes over Davidson. Since dependent claims contain all the limitations of the

³ See MPEP §2131 (Emphasis Added) "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the ... claim."

independent claims, claims 3, 9, and 10 distinguish over Davidson, as well. Accordingly, the Applicants respectfully submit that it is not necessary at this stage to address the Paniccia reference applied in the rejection of claims 3, 9, and 10, and whether or not there is sufficient suggestion or motivation with a reasonable expectation of success for modifying the Davidson reference, as required by MPEP § 2143. The Applicants respectfully request that the Examiner's rejection of claims 3, 9, and 10 be withdrawn.

(6) Rejection under 35 U.S.C. § 103(a) Davidson and Yamada et al.

As noted above, the Examiner rejected claims 5 and 6 under 35 U.S.C. § 103(a) as being unpatentable over Davidson (U.S. Patent No. 6,140,141) in view of Yamada et al. (U.S. Patent No. 5,349,499).

In the section entitled "(2-3) Rejection under 35 U.S.C. § 102(b) Davidson" above, the deficiencies of the prior-art system disclosed in the Davidson reference were discussed. Claims 5 and 6 depend directly from newly amended claim 7. Independent claim 7 distinguishes over Davidson. Since dependent claims contain all the limitations of the independent claims, claims 5 and 6 distinguish over Davidson, as well. Accordingly, the Applicants respectfully submit that it is not necessary at this stage to address the Yamada et al. reference applied in the rejection of claims 5 and 6, and whether or not there is sufficient suggestion or motivation with a reasonable expectation of success for modifying the Davidson reference, as required by MPEP § 2143. The Applicants respectfully request that the Examiner's rejection of claims 5 and 6 be withdrawn.

(7) Rejection under 35 U.S.C. § 103(a) Davidson and Paniccia

As noted above, the Examiner rejected claims 15, 16, 19-22, and 30 under 35 U.S.C. § 103(a) as being unpatentable over Davidson (U.S. Patent No. 6,140,141) in view of Paniccia (U.S. Patent No. 6,251,706).

Before discussing the prior art in detail, it is believed that a brief review of the invention as claimed, would be helpful. Amended independent claim 19 recites, *inter alia*:

YOR920030425US1

10 of 14

10/699,399

... detecting, by a photon-detector, photons from an electronic device during operation of the electronic device, the photons indicative of thermal characteristics of the electronic device, the photon detector located adjacent to a duct that is adjacent to the electronic device, wherein the electronic device forms one side of the duct and a coolant flows through the duct so as to cool the electronic device and the duct and the coolant are at least partially transparent to photons with wavelengths **above 3.6 microns** and the duct is made of at least one of **polished silicon, quartz, sapphire, glass and diamond**. (emphasis added)

The deficiencies of the Davidson reference are discussed in the section entitled "(2-3) Rejection under 35 U.S.C. § 102(b) Davidson", above. The Examiner correctly states on page 7 of the Office Action that "Davidson does not disclose photons being used to detect thermal characteristics of the device; and generating a thermal distribution of the device based on information from the photon detector." This is because Davidson is not directed to measuring thermal distributions of chips, as is the present invention. Davidson is directed to sensing voltages of signals on a die. Davidson, col. 3, lines 41-42. An important distinction between the two inventions is that **in Davidson, the voltages are not measured by sensing infrared radiation, but by sensing a polarization of light reflected back from the device (Col. 1, lines 25-29) or by measuring the intensity of near-infrared radiation (Col. 2, lines 58-60) emitted from the circuit.**

The Examiner goes on to combine Paniccia.⁴ Paniccia uses window material that is transparent to IR wavelengths and also uses an infrared camera. However, Paniccia does not show or suggest a cooling system that uses coolant flowing through a duct so as to cool an electronic device, as recited in claim 19.

In order to combine or modify references under 35 USC § 103, there must be a sufficient suggestion or motivation with a reasonable expectation of success. MPEP § 2143. Davidson does not operate in the IR frequency range. Davidson, col. 2, line 59. The two materials specifically called out by Davidson, fused quartz and BK-7 glass, are

⁴ Applicants make no statement as to whether such a combination is even proper.

completely sufficient for the near-infrared radiation range that Davidson operates in. Davidson, col. 4, lines 1 and 2. Thus, one would have no reason to take the IR transparent window material from Paniccia, a reference that does not even pertain to liquid cooling, and exchange it for the upper window of a cooling duct in Davidson. In addition, Davidson is not concerned with generating a thermal distribution. In Davidson, the voltages are **not** measured by sensing **infrared radiation**, **but by sensing a polarization** of light reflected back from the device (Col. 1, lines 25-29) or by measuring the **intensity of near-infrared radiation** (Col. 2, lines 58-60) emitted from the circuit.

Therefore, one would not be motivated to combine the Paniccia reference with the Davidson reference. When there is no suggestion or teaching in the prior art, the suggestion can not come from the Applicant's own specification. The Federal Circuit has repeatedly warned against using the Applicant's disclosure as a blueprint to reconstruct the claimed invention out of isolated teachings of the prior art. See MPEP § 2143 and Grain Processing Corp. v. American Maize-Products, 840 F.2d 902, 907, 5 USPQ2d 1788 1792 (Fed. Cir. 1988) and In re Fitch, 972 F.2d 160, 12 USPQ2d 1780, 1783-84 (Fed. Cir. 1992). The prior art reference Paniccia taken alone and/or in view of Davidson does not suggest, teach or mention a duct partially transparent to photons with wavelengths above 3.6 microns and made of at least one of polished silicon, quartz, sapphire, glass and diamond. Accordingly, claims 15, 16, 19-22, and 30 distinguish over Paniccia taken alone and/or in view of Davidson for this reason as well.

(8) Rejection under 35 U.S.C. § 103(a) Davidson and Paniccia in view of Yamada

As noted above, the Examiner rejected claims 17 and 18 under 35 U.S.C. § 103(a) as being unpatentable over Davidson (U.S. Patent No. 6,140,141) and Paniccia (U.S. Patent No. 6,251,706) in view of Yamada et al. (U.S. Patent No. 5,349,499).

In the section entitled (8) Rejection under 35 U.S.C. § 103(a) Davidson and Paniccia above, the deficiencies of the prior-art system disclosed in the Davidson and Pannicia references were discussed. Claims 17 and 18 depend directly from newly amended

SEP 26 2006

claim 19. Independent claim 19 distinguishes over Davidson and Paniccia. Since dependent claims contain all the limitations of the independent claims, claims 17 and 18 distinguish over Yamada et al., as well.

Accordingly, the Applicants respectfully submit that it is not necessary at this stage to address the Yamada et al. reference applied in the rejection of claims 17 and 18, and whether or not there is sufficient suggestion or motivation with a reasonable expectation of success for modifying the Yamada et al reference, as required by MPEP § 2143. The Applicants respectfully request that the Examiner's rejection of claims 17 and 18 be withdrawn.

CONCLUSION

In this Response, Applicants have amended certain claims. In light of the Office Action, Applicants believe these amendments serve a useful clarification purpose, and are desirable for clarification purposes, independent of patentability. Accordingly, Applicants respectfully submit that the claim amendments do not limit the range of any permissible equivalents.

Applicants acknowledge the continuing duty of candor and good faith to disclosure of information known to be material to the examination of this application. In accordance with 37 CFR §1.56, all such information is dutifully made of record. The foreseeable equivalents of any territory surrendered by amendment are limited to the territory taught by the information of record. No other territory afforded by the doctrine of equivalents is knowingly surrendered and everything else is unforeseeable at the time of this amendment by the Applicants and their attorneys.

Applicants respectfully submit that all of the grounds for rejection stated in the Examiner's Office Action have been overcome, and that all claims in the application are allowable. No new matter has been added. It is believed that the application is now in condition for allowance, which allowance is respectfully requested.

YOR920030425US1

13 of 14

10/699,399

PLEASE CALL the undersigned if that would expedite the prosecution of this application.

Respectfully submitted,

Date: September 26, 2006

By:


Jon Gibbons, Reg. No. 37,333
Attorney for Applicants

FLEIT, KAIN, GIBBONS, GUTMAN, BONGINI, & BIANCO P.L.
551 N.W. 77th Street, Suite 111
Boca Raton, FL 33487
Tel (561) 989-9811
Fax (561) 989-9812

YOR920030425US1

14 of 14

10/699,399